

REMARKS

The Applicants sincerely appreciate the thorough examination of the present application as evidenced by the Office Actions of June 24, 2005, and November 29, 2005, and by the telephonic interview of February 22, 2006. In response, the Applicants have canceled Claim 2; rewritten Claim 3 in independent form; and canceled Claims 16-18. In the following remarks, the Applicants will show that all claims are patentable over the cited art. A Notice of Allowance is thus respectfully requested in due course. Moreover, the Applicants note that claims have been canceled and amended to advance prosecution of the present application without prejudice to the Applicants' right to pursue canceled and/or unamended claims in a continuing application.

The present Amendment addresses the issues raised in the Final Office Action of November 29, 2005, and also the issues discussed with the Examiner in the telephonic interview of February 22, 2006. The substance of the interview is presented in the following remarks relating to Claim 1. Accordingly, the Applicants believe that this response satisfies all requirements of a written statement of the substance of the interview as set forth in 37 C.F.R. Sec. 1.133(b). If the Examiner should need any additional submission from the Applicants relating to the Interview of February 22, 2006, the Applicants respectfully request that the Examiner contact the undersigned attorney at his earliest convenience.

As suggested by the Examiner, each of the independent claims has been amended to clarify that the showerhead is on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead. As used herein, the term "plane" has its ordinary mathematical/geometrical meaning. As defined on-line by Google, for example, a plane is:

(mathematics) an unbounded two-dimensional shape; "we will refer to the plane of the graph as the X-Y plane"; "any line joining two points on a plane lies wholly on that plane"

<http://www.google.com/search?hl=en&lr=&oi=defmore&defl=en&q=define:plane>.

Accordingly, a plane does not include a surface of a cylinder or a portion thereof.

I. All Rejections Under 35 U.S.C. Sec. 112 Have Been Overcome

Claims 16-18 have been rejected under 35 U.S.C. Sec. 112 as being indefinite. In response, the Applicants have canceled Claims 16-18. Accordingly, all rejections under 35 U.S.C. Sec. 112 have been overcome.

II. Claim 3 Is Patentable

Claim 3 has been rejected under 35 U.S.C. Sec. 102(b) as being anticipated by U.S. Patent No. 6,211,622 to Ryoji et al. (Ryoji). Claim 3 has also been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over U.S. Patent No. 6,352,594 to Cook et al. ("Cook") in view of U.S. Patent No. 6,449,425 to Sandhu et al. ("Sandhu").

As rewritten in independent form, Claim 3 recites a deposition system for depositing a layer on a substrate, the deposition system comprising:

- a process chamber;
- a susceptor in the process chamber, the susceptor being configured to receive a substrate for depositing a layer thereon;
- a showerhead on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead, the showerhead being configured to receive reaction gases and to introduce the reaction gases into the process chamber, the showerhead including a heating element therein for heating reaction gases prior to introducing the reaction gases into the reaction chamber, wherein the showerhead is further configured to spray the reaction gases into the process chamber in parallel with a substrate received on the susceptor wherein the showerhead comprises,
 - a housing,
 - at least one inlet port through which the reaction gases are received into the showerhead, and
 - a spray plate adjacent the process chamber through which reaction gases are introduced into the process chamber,
 - wherein the heating element comprises a heating wire in the housing between the inlet port and the spray plate. (Underline added.)

Claim 3 is patentable over the cited art for at least the reasons discussed below.

A. Claim 3 Is Patentable Over Ryoji

In support of the rejection of Claim 3, the Final Office Action states that:

Ryoji et al teaches a CVD apparatus that includes: a processing chamber 3; a susceptor for holding a substrate; and a shower head 42 comprising a housing, inlet port supplying Ar gas a spray plate for introducing the gas into the process chamber parallel to the substrate, and a coiled wire heating element in the housing connected to

a first and second terminal. (Entire document, specifically, Figure 14) The apparatus of Ryoji can inherently perform ALD.

Final Office Action, pages 2-3.

The Applicants respectfully submit that Ryoji fails to teach or suggest at least a heating element for heating reaction gases wherein the heating element comprises a heating wire. As discussed with respect to the electron-beam excited plasma processing equipment shown in Figure 14 of Ryoji:

[T]he accelerating electrode 36 is also used as a process gas introducing port. ...
[S]ince the accelerating electrode 36 is heated by the input accelerating current up to the high temperature, the process gas is thermally decomposed when the process gas is passed through the high temperature portion of the accelerating electrode 36.
(Underline added.)

Ryoji, col. 5, lines 12-17. Ryoji, however, fails to teach or suggest a heating wire for heating reaction gases because the process gas of Ryoji is heated using a high temperature portion of accelerating electrode 36.

Moreover, the cathode 11 of Ryoji cannot be interpreted as a heating wire for heating reaction gases because the cathode 11 of Ryoji is used to generate a plasma of an inert gas. As discussed in Ryoji:

A cathode 11 having a filament for emitting thermions is provided in the cathode chamber 1. A nozzle 12 is provided to the cathode chamber 1 to supply an inert gas such as an argon (Ar) gas, etc. ... The plasma of the inert gas can be generated by the electron flow, which is supplied by the cathode 11 and the discharge electrode, in the discharge chamber 2. (Underline added.)

Ryoji, col. 7, lines 27-42. Even if the cathode 11 of Ryoji is interpreted as heating the inert gas (such as argon), the cathode 11 of Ryoji is not used to heat the process gas which is introduced through the accelerating electrode 36. Accordingly, the cathode 11 of Ryoji fails to teach or suggest a heating wire for heating reaction gases as recited in Claim 3.

Moreover, Ryoji also fails to teach or suggest a showerhead on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead.

For at least the reasons discussed above, the Applicants respectfully submit that the deposition system of Claim 3 is patentable over Ryoji.

B. Claim 3 Is Patentable Over The Combination Of Cook And Sandhu

The Final Office Action concedes that: "Cook et al does not [teach] a coiled wire gas heater in the first plenum and connected to a terminal." Final Office Action, page 8. In support of the rejection, the Final Office Action states that:

Sandhu ... teaches a gas heater in a first plenum of a showerhead.

The motivation for adding the gas heater of Sandhu et al to the apparatus of Cook et al is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al.

Therefore it would have been obvious to one of ordinary skill in the art ... to add the gas heater of Sandhu et al to the apparatus of Cook et al.

Final Office Action, page 8.

As set forth in the Manual Of Patent Examining Procedure (MPEP), three basic criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *See*, MPEP, Sec. 2143.

The Applicants respectfully submit that there is no motivation to modify the apparatus of Cook to include the gas heater of Sandhu, and that Cook actually teaches away from such a modification. As discussed in portions of Cook cited in the Final Office Action:

FIG. 7 illustrates a gas injector 78 having a body 80.... Two gas fittings 84, 86 are shown, providing input for reactant gas to gas channels 88, 90. A water channel 92 is shown between the channels 88, 90 for passage of water to cool the injector 78. (Underline added.)

Cook, col. 4, lines 63-65. Cook teaches away from inclusion of heating element 222 coupled to a gas conduit from Sandhu because Cook discusses "passage of water to cool the injector 78."

The Response to Arguments section at pages 13-14 of the Final Office Action provides additional commentary regarding alleged motivation to modify the water cooled

injector of Cook to include the gas heater of Sandhu. Among other comments, the Final Office Action states that:

[W]hile it is true that Cook et al teaches cooling the injector, this does not amount to a teaching that the gas should not be heated. ... The injector of Cook is cooled to prevent the premature deposition, and thus does not prevent the gas from being heated.

Final Office Action, pages 13-14. The alleged motivation to combine contradictory elements of Cook and Sandhu appears to be improper hindsight based on the Applicants' disclosure as opposed to the prior art. As set forth in MPEP Sec. 2143, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure.

The disclosure of Cook specifically discusses cooling the gas injectors as opposed to including a heater in the gas injectors. Accordingly, nothing in either Cook or Sandhu teaches or suggests use of the gas heater of Sandhu in the cooled gas injector of Cook, and the inclusion of such a heater in the cooled gas injector of Cook would defy the logic of cooling the gas injector of Cook. If the Examiner should maintain any rejections of any claims based on the combination of Sandhu and Cook, the Applicants request that the Examiner identify in the art the teaching or suggestion to combine Sandhu and Cook as required by MPEP Sec. 2143.

Accordingly, the Applicants respectfully submit that the combination of Cook and Sandhu fails to teach or suggest the recitations of Claim 3 and that Claim 3 is thus patentable over the combination of Cook and Sandhu.

**C. Allowance Of Independent Claim 3 And
Dependent Claims 4-11 Is Respectfully Requested**

For at least the reasons discussed above, the Applicants respectfully submit that Claim 3 is patentable over Ryoji and the combination of Cook and Sandhu. In addition, dependent Claims 4-11 are patentable at least as per the patentability of Claim 3 from which they depend. Allowance of Claims 3-11 is respectfully requested.

III. Claim 12 Is Patentable

Claim 12 has been rejected under 35 U.S.C. Sec. 102(e) as being anticipated by Sandhu. In addition, Claim 12 has been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over U.S. Patent No. 6,059,885 to Ohashi et al. ("Ohashi") in view of Ryoji. Claim 12 has also been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Cook in view of Sandhu. The Applicants respectfully submit that Claim 12 is patentable over the cited art for at least the reasons discussed below.

Claim 12 recites a deposition system for depositing a layer on a substrate. More particularly, the deposition system includes:

- a process chamber;
- a susceptor in the process chamber, the susceptor being configured to receive a substrate for depositing a layer thereon;
- a showerhead on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead, the showerhead being configured to receive reaction gases and to introduce the reaction gases into the process chamber, the showerhead including a heating element therein for heating reaction gases prior to introducing the reaction gases into the reaction chamber;
- wherein the showerhead comprises a plurality of plenums therein such that each plenum receives at least one respective reaction gas from a respective gas inlet port such that reaction gases from the plenums are introduced into the process chamber without prior mixing of the reaction gases between plenums within the showerhead wherein the plurality of plenums comprises respective base portions thereof having spray holes therethrough, wherein the respective base portions are co-planar, wherein the first plenum defines a first cavity providing fluid communication between a first gas inlet port and a first plurality of spray holes, wherein the second plenum defines a second cavity providing fluid communication between a second gas inlet port and a second plurality of spray holes, wherein the first and second cavities are separated, and wherein the first plenum has a length perpendicular to the co-planar base portions that is greater than a length of the second plenum perpendicular to the co-planar base portions.

Claim 12 is patentable over the cited art for at least the reasons discussed below.

A. Claim 12 Is Patentable Over Sandhu

With respect to Sandhu, to the extent that sub-conduits 228 and passageway 230 are interpreted as first and second plenums as set forth in the Final Office Action, these elements of Sandhu fail to teach or suggest first and second plenums defining respective first and second cavities that are separated. The passageway 230 and the sub-conduits 228 of Sandhu fails to teach or suggest separated cavities because the sub-conduits 228 are included in the

passageway 230. *See*, Figures 9-12. Sandhu also fails to teach or suggest first and second plenums having different lengths perpendicular to co-planar base portions.

The Response To Arguments Section at page 14 of the Final Office Action sets forth additional commentary regarding the definition of the first and second cavities being separated. In particular, the Final Office Action states that:

The gases in the sub-conduits 228 and the gases in the passageway 230 [of Sandhu] are delivered to the processing chamber without mixing. Therefore, the chambers are separate. The Examiner notes that the present invention includes a first cavity 212 inside the second cavity 214 (see figure 10).

Final Office Action, page 14.

The Applicants respectfully submit that a reexamination of Figure 10 of the present application and related portions of the specification together with related Figures 8 and 9 will demonstrate that the structure of Figure 10 includes a center plenum 212 between two separate side plenums 214. As set forth on page 4 of the present application, Figure 8 is prospective view of a showerhead, and Figures 9 and 10 are sectional views taken along lines III-III and IV-IV of Figure 8. The structure of Figures 8-10 is discussed in greater detail on pages 8 and 9 of the present application. Each of the center plenum 212 and both side plenums 214 are separate and none is included in another. Moreover, Sandhu also fails to teach or suggest a showerhead on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead. Accordingly, Claim 12 is patentable over Sandhu.

B. Claim 12 Is Patentable Over The Combination of Ohashi and Ryoji

With respect to the rejection based on Ohashi and Ryoji, the combination of Ohashi and Ryoji fails to teach or suggest the system of Claim 12. As stated in the Final Office Action:

Ohashi et al differs from the present invention in that Ohashi et al does not a gas heater in the first plenum or that the length of the first plenum perpendicular to the co-planar base is longer than the length of the second plenum perpendicular to the co-planar base.

Final Office Action, page 6.

The Applicants respectfully submit that it would not be obvious to somehow selective substitute the accelerating electrode 36 (used as a process gas introducing port) and/or the

discharge chamber 2 and/or elements thereof from the electron-beam excited plasma processing equipment of Ryoji for the space areas Sz and/or Sx of the vapor deposition apparatus of Ohashi. In particular, Ohashi teaches away from such a combination. As discussed in Ohashi:

the inventors have made various studies on the structure of a vapor deposition apparatus ... which can suppress occurrence of gas eddy flow and disturbance of gas flow.... As a result, the inventors have found that the above problem could be solved by any of a vapor deposition apparatus having such a structure that a straightening vane having a specific structure is disposed in a specific arrangement so that the gas flow rate is varied between the center portion and the outer peripheral portion in the reactor.... (Underline added.)

Ohashi, col. 3, lines 40-54. As further stated in Ohashi:

in any case, the gas holes 17a formed in the center area of the straightening vane are disposed substantially at equal intervals so that the reaction gas passing through the gas holes 17a of the center area is straightened (rectified) and flows down onto the surface of the wafer substrate W ... at a uniform rate. (Underline added.)

Ohashi, col. 11, lines 1-6. While the Final Office Action states that "it would be obvious to optimize the shape of the plenum [of Ohashi] to optimize the gas flow and temperature distribution of the gas," the addition of the heating element of Ryoji to the structure of Ohashi could not reasonably be expected to provide the reduced eddy flow and disturbance of gas flow provide by the straightening vane of Ohashi for the reasons discussed above.

In contrast to the straightening vane of Ohashi providing rectified down flow, the accelerating electrode 36 used as a process gas introducing port and the orifices 42 of Ryoji all direct gas in a direction parallel to the substrate. Because Ohashi is directed to vapor deposition apparatus including straightening vanes providing down flow to suppress eddy flow and disturbance of gas flow, Ohashi teaches away from use of elements of Ryoji providing gas flow in directions 90 degrees offset from gas flow provided by the straightening vanes of Ohashi. Moreover, there is no motivation in either Ohashi or Ryoji to use gas heating and/or ionization from the electron-beam excited plasma processing equipment of Ryoji in the vapor deposition apparatus of Ohashi. Moreover, neither Ryoji nor Ohashi, taken alone or in combination, teaches or suggests a showerhead on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead. Accordingly, Claim 12 is patentable over the combination of Ohashi and Ryoji.

C. Claim 12 Is Patentable Over The Combination Of Cook And Sandhu

With respect to the rejection base on Cook and Sandhu, the combination of Cook and Sandhu fails to teach or suggest the system of Claim 12. For example, Cook and Sandhu both fail to teach or suggest first and second plenums having different lengths perpendicular to co-planar base portions. Moreover, there is no motivation to somehow selectively combine elements of the CVD apparatus providing gas flow parallel with respect to processed wafers of Cook with the plasma processing apparatus providing gas flow perpendicular with respect to the processed wafers of Sandhu. Accordingly, Claim 12 is patentable over the combination of Cook and Sandhu.

**D. Allowance Of Independent Claim 12 And
Dependent Claims 13 And 25-27 Is Respectfully Requested**

The Applicants thus submit that Claim 12 is patentable over the cited art for at least the reasons discussed above. In addition, dependent Claims 13 and 25-27 are patentable at least as per the patentability of Claim 12 from which they depend.

IV. Claim 14 Is Patentable Over the Cited Art

Claim 14 has been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Ohashi in view of Ryoji. Claim 14 has also been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Ohashi in view of Sandhu. In addition, Claim 14 has been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Cook, Sandhu, and U.S. Patent No. 5,958,140 to Arami et al. ("Arami"), and further in view of Ohashi. The Applicants respectfully submit that Claim 14 is patentable over the cited art for at least the reasons discussed below.

Claim 14 recites a deposition system for depositing a layer on a substrate. More particularly, the deposition system includes:

- a process chamber;
- a susceptor in the process chamber, the susceptor being configured to receive a substrate for depositing a layer thereon; and
- a showerhead on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead, the showerhead being configured to receive reaction gases and to introduce the reaction gases into the process chamber, the

showerhead including a heating element therein for heating reaction gases prior to introducing the reaction gases into the reaction chamber;

wherein the showerhead comprises a plurality of plenums therein such that each plenum receives at least one respective reaction gas such that reaction gases from the plenums are introduced into the process chamber without prior mixing of the reaction gases between plenums within the showerhead;

wherein a first of the plenums includes a heating element therein configured to heat gases passing through the first plenum and wherein a second of the plenums is free of a heating element;

wherein the first plenum includes an extended portion such that the first plenum extends further from the process chamber than the second plenum and wherein the heating element is located in the extended portion of the first plenum.

Claim 14 is patentable over the cited art for at least the reasons discussed below.

A. Claim 14 Is Patentable Over The Combination of Ohashi and Ryoji

With respect to the rejection based on Ohashi and Ryoji, the Final Office Action states that:

Ohashi et al differs from the present invention in that Ohashi et al does not a gas heater in the first plenum or that the length of the first plenum perpendicular to the co-planar base is longer than the second plenum perpendicular to the co-planar base.

Ryoji et al, as discussed above, teaches a gas source with a gas heater in a plenum of a showerhead.

The motivation for replacing the gas inlet of Ohashi et al with the gas source of Ryoji et al is to provide a source of gas that is heated and ionized as taught by Ryoji et al.

Alternatively, the motivation for adding the heating element of Ryoji et al to the plenum of Ohashi et al is to heat the gas as it enters the plenum, and it would be obvious to optimize the shape of the plenum to optimize the gas flow and temperature distribution of the gas. ...

Final Office Action, page 6.

The Applicants respectfully submit that it would not be obvious to somehow selective substitute the accelerating electrode 36 (used as a process gas introducing port) and/or the discharge chamber 2 and/or elements thereof from the electron-beam excited plasma processing equipment of Ryoji for the space areas Sz and/or Sx of the vapor deposition apparatus of Ohashi. In particular, Ohashi teaches away from such a combination. As discussed in Ohashi:

the inventors have made various studies on the structure of a vapor deposition apparatus ... which can suppress occurrence of gas eddy flow and disturbance of gas flow.... As a result, the inventors have found that the above problem could be solved

by any of a vapor deposition apparatus having such a structure that a straightening vane having a specific structure is disposed in a specific arrangement so that the gas flow rate is varied between the center portion and the outer peripheral portion in the reactor.... (Underline added.)

Ohashi, col. 3, lines 40-54. As further stated in Ohashi:

in any case, the gas holes 17a formed in the center area of the straightening vane are disposed substantially at equal intervals so that the reaction gas passing through the gas holes 17a of the center area is straightened (rectified) and flows down onto the surface of the wafer substrate W ... at a uniform rate. (Underline added.)

Ohashi, col. 11, lines 1-6. While the Final Office Action states that "it would be obvious to optimize the shape of the plenum [of Ohashi] to optimize the gas flow and temperature distribution of the gas," the addition of the heating element of Ryoji to the structure of Ohashi could not reasonably be expected to provide the reduced eddy flow and disturbance of gas flow provide by the straightening vane of Ohashi for the reasons discussed above.

In contrast to the straightening vane of Ohashi providing rectified down flow, the accelerating electrode 36 used as a process gas introducing port and the orifices 42 of Ryoji all direct gas in a direction parallel to the substrate. Because Ohashi is directed to vapor deposition apparatus including straightening vanes providing down flow to suppress eddy flow and disturbance of gas flow, Ohashi teaches away from use of elements of Ryoji providing gas flow in directions 90 degrees offset from gas flow provided by the straightening vanes of Ohashi. Moreover, there is no motivation in either Ohashi or Ryoji to use gas heating and/or ionization from the electron-beam excited plasma processing equipment of Ryoji in the vapor deposition apparatus of Ohashi. In addition, neither Ryoji nor Ohashi, taken alone or in combination, teaches or suggests a showerhead on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead. Accordingly, Claim 14 is patentable over the combination of Ohashi and Ryoji.

B. Claim 14 Is Patentable Over The Combination of Ohashi and Sandhu

With respect to the rejection based on Ohashi and Sandhu, the Final Office Action states that Ohashi teaches:

a shower head having a first plenum S receiving a first gas, and a second plenum 719 receiving a second gas. The first plenum extends further from the process chamber than the second plenum. (Figure 7)

Final Office Action, page 6. Moreover, the Final Office Action concedes that Ohashi does not teach a gas heater in the first plenum. *See*, Final Office Action, page 6. In further support of the rejection, the Final Office Action states that:

Sandhu et al ... teaches a gas heater in a first plenum of a showerhead.

The motivation for adding the gas heater of Sandhu et al to the apparatus of Ohashi et al is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al.

Final Office Action, page 8.

Accepting the Examiner's characterizations of Ohashi and Sandhu for the sake of argument, nothing in either Ohashi or Sandhu teaches or suggests a heating element located in an extended portion of a plenum. In particular, the heating elements 222 attached to the sub-conduits 228 of Sandhu are also within the internal passageway defined by the walls 342. To the extent that the sub-conduits 228 and the internal passageway defined by the walls 342 are interpreted as first and second plenums, Sandhu fails to teach or suggest that the heating elements 222 are included in a first one of the sub-conduits 228 or the passageway defined by the walls 342 and that the other of the sub-conduits 228 or the passageway defined by the walls 342 is free of the heating elements. Moreover, Sandhu fails to teach or suggest that the heating elements 222 are in an extended portion of either of the sub-conduits 228 or the passageway defined by the walls 342. In addition, neither Ohashi nor Sandhu, taken alone or in combination, teaches or suggests a showerhead on a side of the process chamber such that a plane defined by a surface of a substrate received on the susceptor extends beyond an edge of the substrate and intersects the showerhead.

Accordingly, the Applicants respectfully submit that Claim 14 is patentable over the combination of Ohashi and Sandhu.

**C. Claim 14 Is Patentable Over The
Combination Of Cook, Sandhu, Arami, and Ohashi**

With respect to the rejection based on Cook, Sandhu, Arami, and Ohashi, the Final Office Action concedes that:

Cook et al, Sandhu et al, and Arami et al differ from the present invention in that they do not teach that the first plenum extends further from the processing chamber than the second plenum.

Final Office Action, page 12. In support of the rejection, the Final Office Action states that:

Ohashi et al was discussed above and includes a first plenum S extends further from the processing chamber than the second plenum 719.

The motivation for adding the motivation for elongating the first plenum in the apparatus of Cook et al, Sandhu et al, and Arami et al is to provide a specific shape for the plenums as taught by Ohashi et al. ...

Final Office Action, pages 12-13.

Accepting the Examiner's characterizations of Cook, Sahdhu, Arami, and Ohashi for the sake of argument, nothing in any of the cited references (taken alone or in combination) teaches or suggests a heating element located in an extended portion of a plenum.

Accordingly, the Applicants respectfully submit that Claim 14 is patentable over the combination of Cook, Sahdhu, Arami, and Ohashi. In addition, dependent Claim 15 is patentable at least as per the patentability of Claim 14 from which it depends. If any rejection of Claim 14 should be maintained based on the combination of Cook, Sahdhu, Arami, and Ohashi, the Applicants respectfully request that the Examiner point out portions of Cook, Sahdhu, Arami, and/or Ohashi that teach or suggest a heating element located in an extended portion of a plenum.

For at least the reasons discussed above, the Applicants respectfully submit that Claim 14 is patentable over the combination of Cook, Sandhu, Arami, and Ohashi.

**D. Allowance Of Independent Claim 14 And
Dependent Claims 15 And 21-24 Is Respectfully Requested**

The Applicants thus submit that Claim 14 is patentable over the cited art for at least the reasons discussed above. In addition, dependent Claims 15 and 21-24 are patentable at least as per the patentability of Claim 14 from which they depend.

V. Dependent Claims 21-22 Are Separately Patentable Over the Cited Art

Claims 21-22 have been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Ohashi in view of Ryoji. The Applicants respectfully submit that Claims 21-22 are patentable for at least the reasons discussed above with regarding to independent Claim 14.

Dependent Claims 21-22 are also separately patentable for at least the additional reasons discussed below.

Claims 21 and 22 both depend from Claim 14, and thus, each includes all recitations of Claim 14 as discussed above. Claim 21 includes the additional recitations that the first and second plenums share a same spray plate having spray holes therethrough for the first and second plenums. Claim 22 includes the additional recitations that the first and second plenums comprise respective first and second base portions thereof having spray holes therethrough wherein the first and second base portions of the first and second plenums are co-planar.

In support of the rejection of dependent Claims 21 and 22, the Final Office Action states that:

Ohashi et al differs from the present invention in that Ohashi et al does not a gas heater in the first plenum or that the length of the first plenum perpendicular to the co-planar base is longer than the length of the second plenum perpendicular to the co-planar base.

Ryoji et al, as discussed above, teaches a gas source with a gas heater in a plenum of a showerhead.

The motivation for replacing the gas inlet of Ohashi et al with the gas source of Ryoji et al is to provide a source of gas that is heated and ionized as taught by Ryoji et al.

Alternately, the motivation for adding the heating element of Ryoji et al to the plenum of Ohashi et al is to heat the gas as it enters the plenum, and it would be obvious to optimize the shape of the plenum to optimize the gas flow and temperature distribution of the gas.

Final Office Action, page 6.

Accepting the characterization of Ryoji set forth in the Final Office Action for the sake of argument, the Office Action does not identify any portions of Ryoji that teach or suggest the recitations conceded missing from Ohashi (*i.e.*, the length of the first plenum perpendicular to the co-planar base is longer than the length of the second plenum perpendicular to the co-planar base). Nothing in Ohashi teaches or suggests different plenums sharing a same spray plate, or base portions of first and second plenums being co-planar. As set forth in MPEP Sec. 2143, to establish a *prima facie* case of obviousness, the prior art references when combined must teach or suggest all the claim limitations.

Accordingly, Claims 21 and 22 are separately patentable over the combination of Ohashi and Ryoji.

VI. Dependent Claim 27 Is Separately Patentable Over the Cited Art

Claim 27 has been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Ohashi in view of Ryoji. The Applicants respectfully submit that Claim 27 is patentable for at least the reasons discussed above with regarding to independent Claim 12. Dependent Claims 27 is also separately patentable for at least the additional reasons discussed below.

Claim 27 depends from Claim 12, and thus includes all recitations of Claim 12 as discussed above. Claim 27 includes the additional recitations that the first and second plenums are separated along a continuous plane therebetween. Neither Ohashi or Ryoji, taken alone or in combination teaches or suggests first and second plenums separated along a continuous plane therebetween. Moreover, Ohashi teaches away from such a structure, because the peripheral space area S_x surrounds the center space area S_z so that the two space areas cannot be separated by a continuous plane therebetween.

Accordingly, the Applicants respectfully submit that dependent Claim 27 is separately patentable.

CONCLUSION

Accordingly, the Applicants submit that all pending claims in the present application are in condition for allowance, and a Notice of Allowance is respectfully requested in due course. The Examiner is encouraged to contact the undersigned attorney by telephone should any additional issues need to be addressed.

Respectfully submitted,



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